Macroinvertebrate Production on Marginal River Channel Sandbars

Expectation:	Total annual production of 3.0 - 5.0 $g/m^2/yr$ for macroinvertebrates on marginal river channel sandbars.
Author:	Joseph W. Koebel Jr., South Florida Water Management District
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Relevant Endpoint(s):	Restoration – Biological Integrity – Productivity Restoration – Biological Integrity – Colonization Rates Restoration – System Functional Integrity – Energy Flow Dynamics Restoration – System Functional Integrity - Habitat Quality Restoration – System Functional Integrity – Habitat Use
Baseline Condition:	Channelization of the Kissimmee River greatly altered the geomorphology of the historic river channel. Marginal river channel sandbars no longer exist along most of the channelized river.
Reference Condition:	Historical data on invertebrate secondary production on marginal river channel sandbar habitats are not available for the pre-channelized Kissimmee River. In fact, I am unaware of any data on invertebrate production in submerged sandbar habitats. Although marginal channel sandbars will be subjected to different flow regimes than mid-channel benthic habitats, it is likely that community structure characteristics, including species composition and functional feeding group composition of marginal sandbars will be similar to that of adjacent mid-channel benthic habitats. However, because marginal channel sandbars may be subjected to intermittent drying, aquatic invertebrate mean annual density, biomass, and production may be less than that of mid-channel benthic habitats. Annual production estimates for mid-channel, sand-dwelling benthic communities range from 0.12 $g/m^2/yr$ in a second-order blackwater South Carolina stream (Smock et al. 1985) to 13.7 $g/m^2/yr$ in the Satilla River, Georgia (Benke et al. 1984). Total annual production of macroinvertebrates inhabiting marginal river channel sandbars within the restored Kissimmee River likely will fall within this range.
Mechanism Relating Restoration To Reference Conditions:	Restoration of continuous, variable flow through remnant river channels is expected to flush accumulated organic matter from river channels and redistribute existing sand substrate to form sandbars along inside margins of meanders. Habitat restoration will be directly linked to discharge patterns and duration of flow. Results of the Demonstration Project (Toth 1991) indicate that average daily discharges between 11 and 41 cms were sufficient to flush remnant river channels and transport sand sediment to form sandbars. Minimum average daily discharge > 11 cms is expected throughout most of the year within the restored system.
Time Course for Restoration:	It is likely that reestablished discharge through remnant river channels will restore marginal river channel sandbars within 12 months following initiation of the interim upper basin regulation schedule. Periods of unusually high discharge through remnant channels likely would reduce the time frame associated with restoration of marginal channel sandbars.

Colonization and production of benthic biota will be a function of colonization rates after habitat has been restored. Colonization by some taxa will be rapid. Chironomids are likely to colonize within 90 days, followed by mayflies and dragonflies within six to 12 months. Other larger taxa including clams and mussels likely will colonize within 1 – 2 years. Total community annual production of 3.0 – 5.0 $g/m^2/yr$ likely will be achieved within two years following initiation of the interim upper basin regulation schedule and formation of sandbars.

Adjustments for External Constraints:

None: Because all taxa likely to colonize and persist on marginal channel sandbars exist within the Kissimmee – Okeechobee ecosystem, there are no external constraints that would delay or preclude restoration and production of the biotic component of this habitat. However, prolonged drought that exposes marginal channel sandbars likely would eliminate or greatly reduce macroinvertebrate densities and standing stock biomass, potentially reducing annual production below the expected value. Such a scenario would not indicate failure to meet the stated expectation; rather, it would indicate the natural variability in community production associated with extreme environmental conditions.

Densities of exotic species (e.g., *Corbicula fluminea*) are expected to remain low on river channel sandbars of the restored Kissimmee River. This taxon is not expected to displace any native bivalves or play a major role in the production dynamics of the restored system.

Means of Evaluation:

Sampling of marginal channel sandbars will commence approximately six months following formation, assuming stage and discharge are sufficient to allow for colonization and persistence by aquatic invertebrates. Replicate (5, minimally) "stovepipe" (area = 0.105 m^2) samples will be collected monthly from randomly selected sandbars within reconnected river channels. The sampling location on the sandbar where samples are collected (e.g., distance from shore and approximate distance from channel drop-off) and approximate area (m^2) of inundated sandbar will be recorded to potentially explain variability in macroinvertebrate abundance, biomass, or production associated with seasonal depth, flow, and inundation patterns. Samples will be analyzed for invertebrate species identity, density, and standing stock biomass for each taxon. Production will be calculated using the instantaneous growth rate (IGR) method. Results will be compared to the stated expectation.

REFERENCES

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